SAMPLING AREA BOUNDARY DEFINITION STUDY

NL/TARACORP SUPERFUND SITE GRANITE CITY, ILLINOIS

Prepared for

U.S. Department of the Army
Corps of Engineers, Omaha District
Omaha, Nebraska

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Woodward-Clyde Consultants
2318 Millpark Drive
St. Louis, MO 63043

WCC Project No. 89MC114V

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1.0
PROJECT DESCRIPTION

1.1 INTRODUCTION

This project is part of the Woodward-Clyde Consultants (WCC) Indefinite Delivery Contract with the U.S. Army Corps of Engineers, Omaha District (USACE), Contract No. DACW45-90-D-0008, Work Order 0021, Modification No. 002, for the Sampling Area Boundary Definition Study for the NL/Taracorp Superfund Site (NL Site) located in and near Granite City, Madison, and Venice, Illinois. The purpose of this investigation is to define the extent of the residential area which may have been impacted by emissions from the lead smelter. The limits of the sampling area will be based on the cleanup levels for surficial soils for the residential areas which is a total lead concentration of 500 ppm as established in the Record of Decision (ROD).

To accomplish this, the following sequence of tasks will be performed:

- Summarize lead levels in soil taken from previous studies conducted in the Granite City area by the various agencies

- Develop a soil sampling plan which will step out from the current sampling area to help determine the potential extent of the site

- Complete the field activities and laboratory analytical work required for the Sampling Area Boundary Definition Study

- Prepare a report to summarize the analytical data and recommend new sampling area boundaries

1.2 SITE INFORMATION

The NL Site is located in the cities of Granite City, Madison, and Venice, in Madison County, Illinois, approximately two miles east of St. Louis, Missouri. The site is located within the portion of the Mississippi River Valley known as the American Bottoms. The area is underlain by a sequence of alluvial, glaciofluvial and glaciolacustrine deposits to a depth of approximately 100 feet. The Adjacent Residential Area located around the Main Industrial Property currently includes approximately 520 acres within the towns of Granite City and Madison, Illinois. Residential areas extend to the northeast approximately five miles and to the south approximately three miles. The lead contamination in the soil is, among other factors, related to airborne particulate fallout from the lead smelting operations.

1.3 PREVIOUS INVESTIGATIONS

The Illinois Environmental Protection Agency's (IEPA) Division of Air Pollution Control from 1978 to 1982 monitored ambient air levels of lead at four locations around the site. During this time the NL/Taracorp lead smelter was in operation. The most distant air monitor from the site was located approximately one mile northwest of the smelter, and measured ambient lead levels which exceeded the 1.5 ug/m^3 quarterly average Federal lead standard (IEPA, 1983). The source for majority of the lead measured at this monitor was characterized as the lead smelter (NEA, 1983).

In 1982, the IEPA conducted soil sampling in residential areas located near the NL Site and in areas located up to one mile from the NL Site. Soil lead levels above 500 ppm were found in several soil samples located northwest and southwest of the current site boundaries.

is this correct

A Remedial Investigation (RI) at the NL Site was completed by O'Brien and Gere in September, 1988. A total of 40 locations were sampled that were within one mile of the Main Industrial Property. The RI found lead levels above the 500 ppm cleanup standard in all but six soil samples: three soil samples were located east of the current site boundaries and three soil samples were located west of the site boundaries. The three soil samples located west of the site boundary appear to have been taken along the railroad right-of-way and may not be representative of natural soil.

The Predesign Field Investigation (PDFI) (WCC, 1992) consisted of collecting soil samples from approximately 900 residential parcels within the current site boundaries. The data from soil samples collected in the Adjacent Residential Area was divided into 46 decision units which ranged in size from one to three city blocks. Using a statistical test with 95 percent confidence, decision units were tested to determine if at least 75 percent of the soil samples were below the 500 ppm cleanup standard. The five decision units that passed this statistical test and would not require remediation are located in the southeast section of the Adjacent Residential Area (Figure 31, Draft PDFI, 1992). During the PDFI, soil samples were collected and analyzed at 3108 Colgate at the property owner's request. This property is located outside of the site boundaries, approximately two miles northeast of the Main Industrial Property. Soil lead levels were 60 ppm and 80 ppm for the 0 to 3 inches depth interval and 3 to 6 inches depth interval, respectively. This may indicate a much reduced impact of the lead smelter emissions for the northeast area beyond two miles.

1.4 LITERATURE REVIEW

From previous investigations, lead levels in soils near lead smelters exponentially decreased with distance and can range from 200 ppm to 1,000 ppm at distances of two to five miles from the source (USEPA, 1986). An investigation at a smelter located in southeast Missouri detected elevated lead levels in leaf litter at 20 to 25 miles from the smelter (Zimdahl, 1976). The majority of the lead stabilizes in the top 0 to 5 cm soil layer (USEPA, 1986). Soil lead contamination varies with the smelter emission rate, length of time the smelter has been in operation, prevailing windspeed and direction, regional climatic conditions, and local topography (USEPA, 1986).

Another source of lead in the environment is from automotive exhaust emissions. In 1986 allowable levels of lead in U.S. gasoline were reduced 90% (LaBelle, et al., 1987). Since lead is very stable in soil, the lead levels may remain for many years. A study conducted by S.J. LaBelle and others related regional road traffic in Illinois to surface-soil lead levels. The study areas included the city of Chicago, Chicago suburbs, and downstate Illinois. The downstate area included the whole state of Illinois except the Chicago metropolitan area. A total of 48 locations were sampled in the downstate area and 2 locations were sampled in Madison and St. Clair counties. Sampling locations excluded areas within one mile of smelters and within 6 feet of buildings. For each location, soil samples were taken at the

surface location (2 in. deep). Samples were taken from locations that were 10 ft from the road, 100 ft from the road and from children's play areas. One subsurface sample (10 to 12 in.) was also taken at the location that was 100 ft from the road. The geometric mean for the downstate Illinois soil samples was 43 ppm for surface samples (0 to 2 in.) and 27 ppm for subsurface samples (10 to 12 in.), respectively (LaBelle, et al., 1987). Subsurface soil samples (10 to 12 in.) for downstate Illinois had a mean lead concentration very similar to the USGS average natural lead concentration (background) of 16 ppm for Illinois type soil. From the surface soil lead concentration data, only six locations had a soil sample which exceeded 250 ppm. From the LaBelle study, it is reasonable to expect soil samples in an area with traffic volume such as Granite City to have soil lead levels below the 500 ppm cleanup standard. The majority of the downstate Illinois roads have a traffic volume of $<5,000$ vehicles per day compared to the Chicago metropolitan area which have a traffic volume ranging from $<5,000$ vehicles per day up to $>$ 50,000 vehicles per day.

The size of the area influenced from the lead smelter emissions is partially dependent on the prevailing windspeed and direction, regional climatic conditions, and local topography (USEPA, 1986). The regional prevailing wind directions for the St. Louis metropolitan area are from the south during the seven months of May through November at a mean speed of 7.6 to 10.0 m.p.h. (Ruffner and Bair, 1985). In January and February the prevailing wind directions is from the northwest at a mean speed of 10.5 to 10.8 m.p.h., and in March, April, and December the prevailing wind direction is from the west-northwest at 10.4 to 11.8 m.p.h. The fastest mile recorded per month has a wind direction from the southwest or northwest at wind speeds of 41 to 60 m.p.h. (Ruffner and Bair, 1985). Since the Granite City area is located in the Mississippi River Valley, local topography may influence local wind direction to follow the river direction which is northeast to southwest.

2.0

REGRESSION ANALYSIS OF SOIL LEAD CONCENTRATION VERSUS DISTANCE FROM SOURCE

With decreasing distance from the lead smelter source, the soil lead concentrations from other investigations decreased logarithmically (USEPA, 1986). To help determine the site boundaries of the NL Site, the total lead data taken during the PDFI for the Adjacent Residential Area were plotted versus the sampling location distance from the NL/Taracorp smelter stack. Two plots were made representing concentration versus distance in a northeast direction from the smelter and one plot was made representing concentration versus distance in a southeast direction from the smelter. The lead concentration data from the sampling depth interval of 0 to 3 in. were used. Figure 1 represents samples collected from both sides of Delmar Avenue and Figure 2 represents samples collected from both sides of Edison. Figure 3 represents samples taken along a one block width in the southeast direction from the smelter. See Figure 4 for location of the block intervals plotted. For the two northeast plots, the sample taken at 3108 Colgate, located approximately two miles from the smelter, was included.

The data appears to have a correlation between the logarithm of lead concentration and distance of the sampling point from the source (Figures 1, 2, and 3). A semi-log linear regression was calculated for each plot with 70 percent and 95 percent confidence limits. Based on these plots and with 95 percent confidence, for lead levels to range below the 500 ppm cleanup standard, the sampling area boundary for the northeast direction would extend to approximately two miles from the smelter (Figures 1 and 2). For the southeast direction the sampling area boundary would extend several blocks to approximately one mile from the smelter source (Figure 3). The difference in distance for the two site boundary directions may be influenced by the prevailing wind direction. For seven months of the year the prevailing wind is from the south and the other five months the prevailing wind is from the northwest to west-northwest.

3.0 RECOMMENDATIONS

To determine the extent of the sampling area, it is recommended to use the regression analysis of the logarithm of soil lead concentration versus distance from the smelter source. To verify the regression analysis model, it is recommended that approximately 50 additional soil samples be collected from areas beyond the existing site boundaries. The analytical data from the soil sampling will be incorporated in the regression analysis to confirm the model. Using a confidence level (e.g., 70 percent, 95 percent), prescribed by the USACE and USEPA, with the regression analysis model, the limits of the sampling boundaries can be estimated. The upper confidence level of the regression analysis where the lead concentration is below the 500 ppm cleanup standard will be used to estimate the distance to which the sampling boundaries should be extended (**Figures 1** through 3). To obtain accessible sampling locations, it is recommended to sample public property including parks, schools, libraries, post offices, etc. Public properties identified within a two mile radius of the smelter are included on **Figure 4**.

- why not XRF?

→ no need to do anything in Madison, except possibly further South of Unit #37

→ could just go out w/ XRF + go door-to-door — call Thalkar for availability

4.0
PROPOSED SCOPE OF WORK

4.1 SITE INVESTIGATION OBJECTIVES

Additional information is required to determine the limits of the residential sampling area surrounding the NL Site. Data should be obtained to verify the regression analysis model of soil lead levels versus distance from the smelter. With a given level of confidence, the limits of the sampling area will be based on areas with soil lead levels above the 500 ppm cleanup standard.

4.2 PROPOSED SCOPE OF WORK

4.2.1 Property Access Task

pub. property may have fill, etc.

Property access for the public property will be conducted by Woodward-Clyde in conjunction with the USEPA, Region V. This task will consist of these items:

- Identify public properties of concern and public officials responsible for each property (**Figure 4**)
- Obtain written and/or verbal property access to conduct soil sampling
- Coordinate with USEPA to prepare a standard "Consent For Access To Property" form
- Incorporate property access information into the Property Access Computer Database.

4.2.2 Soil Sampling Task

Analytical soil samples will be collected for approximately 50 locations. A hand augering apparatus will be used to sample the shallow depth interval from 0 to 3 inches. The soil will

5.0
LABORATORY ANALYTICAL PROCEDURES

Soil samples to be collected for the Sampling Area Boundary Definition Study at the NL Site will be analyzed for Total Lead concentration using either SW-846 Method 6010 or Method 7420. For the extraction procedure, SW-846 Method 3051, microwave digestion, will be used. Method 6010 lists the procedures and protocols for the inductively coupled argon plasma spectrophotometer (ICP) and Method 7420 is applicable to the flame atomic absorption (FAA), direct aspiration.

Analysis of the soil samples and QC samples will be conducted by Environmental Science and Engineering, Inc. (ESE). Reporting limits, sample containers, preservatives and holding times will follow SW-846 analytical protocols which are listed in the CDAP.

The level of QC effort provided by the laboratory will be equivalent to the level of QC effort specified in USEPA SW-846, Third Edition, and as described in the ESE Quality Assurance Program Plan (QAPP) include in Appendix, CDAP (1991). Laboratory level of effort will include laboratory control samples, method blanks, and continuing calibration verification.

6.0
PROJECT ORGANIZATION, SCHEDULE, AND COST

6.1 PROJECT ORGANIZATION

The project organization for this investigation will be the same as defined in the CDAP. The organizational structure and responsibility is designed to provide adequate project control and proper quality assurance for the site investigative activities at the NL Site.

6.2 PROJECT SCHEDULE

The proposed schedule for the Sampling Area Boundary Definition Study is shown in Figure 5. It is estimated the study will take approximately two months to complete after approval is given to proceed. Assumptions with this schedule are:

- Notice to proceed will be given by January 11, 1993
- Property access will be granted for the public property
- Weather is permissible for conducting field activities.

With this project schedule a draft report should be submitted in March of 1993.

6.3 PROJECT COSTS

The project costs for this study will be incorporated into the WCC Indefinite Delivery Contract with the USACE, Omaha District, Modification No. 002, Contract No. DACW45-90-D-0008.

be mixed with stainless steel equipment to homogenize the soil samples and placed in the sampling container. Soil borings will be placed away from any painted structures and out from under trees or drain spout runoff areas. The soil sampling task will be conducted in accordance to the appropriate protocols and procedures outlined in the CDAP (WCC, 1991).

4.2.3 Regression Analysis Task

The analytical results from the additional soil sampling will be incorporated into the linear regression analysis of soil lead concentrations versus distance of the sampling location from the smelter source. The upper confidence level of the regression analysis where the lead concentration is below the 500 ppm cleanup standard will be used to estimate the distance to which the sampling boundaries should be extended.

4.2.4 Quality Assurance Objectives

The overall Quality Assurance (QA) objective for the field investigation at the NL Site is to develop and implement procedures for sampling, laboratory analyses, field measurements, and reporting that provide a quality of data that is consistent with and adequate for the intended uses of that data. Quality assurance objectives for field measurement systems are discussed in the appropriate Standard Operating Procedures (CDAP, 1991). Quality assurance objectives for analytical data are discussed below.

Quality assurance objectives are expressed in terms of accuracy, precision, completeness, representativeness, and comparability. Measurement of and target ranges for these parameters will be in accordance with the Data Quality Objectives identified in the CDAP.

The level of Quality Control (QC) effort will consist of collecting and submitting to the contract analytical laboratory a minimum of one field duplicate for every 20 investigative soil samples (5%) and a minimum of one matrix spike (MS) and matrix spike duplicate (MSD) for every 20 investigative soil samples (5%). Field duplicates samples will be analyzed to assess representativeness. MS/MSD samples will be analyzed to assess accuracy and precision.

The Quality Assurance (QA) effort will consist of collecting and submitting to the USACE Missouri River Division Laboratory (MRD) field duplicate soil samples. The level of effort will consist of taking a minimum of one field duplicate for every 10 investigative soil samples. USACE personnel will also be involved in general oversight of field activities as additional assurance of adherence to strict QA/QC protocols.

7.0
DELIVERABLES

During the field investigation, WCC will provide Daily Quality Control Reports (DQCR) to the USACE. These reports will include the information found in the USACE ER-1110-1-263 Chemical Data Quality Management for Hazardous Waste Remedial Activities, October 1, 1990. These reports will be compiled and sent to the USACE PM weekly (along with the bi-weekly confirmation notice package). Should problems arise, WCC will notify the USACE PM immediately and send the DQCR by express mail on a daily basis until the problem has been resolved.

A draft report summarizing the soil sampling activities and findings of the study will be prepared and will include these elements:

- Information related to the implementation of the investigation
- Analytical data results
- Regression analysis of soil lead levels with distance from the source by incorporating the analytical results from the soil sampling program
- Recommendations to identify the limits of the sampling area for the residential area surrounding the NL Site

Upon receipt of USACE, USEPA, and IEPA comments, the comments will be resolved and incorporated into the draft report and a final report prepared. This document will be transmitted to the appropriate federal, state, and local agencies.

8.0 REFERENCES

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Figure 1

Soil Lead Level vs. Distance From Smelter

Delmar Avenue

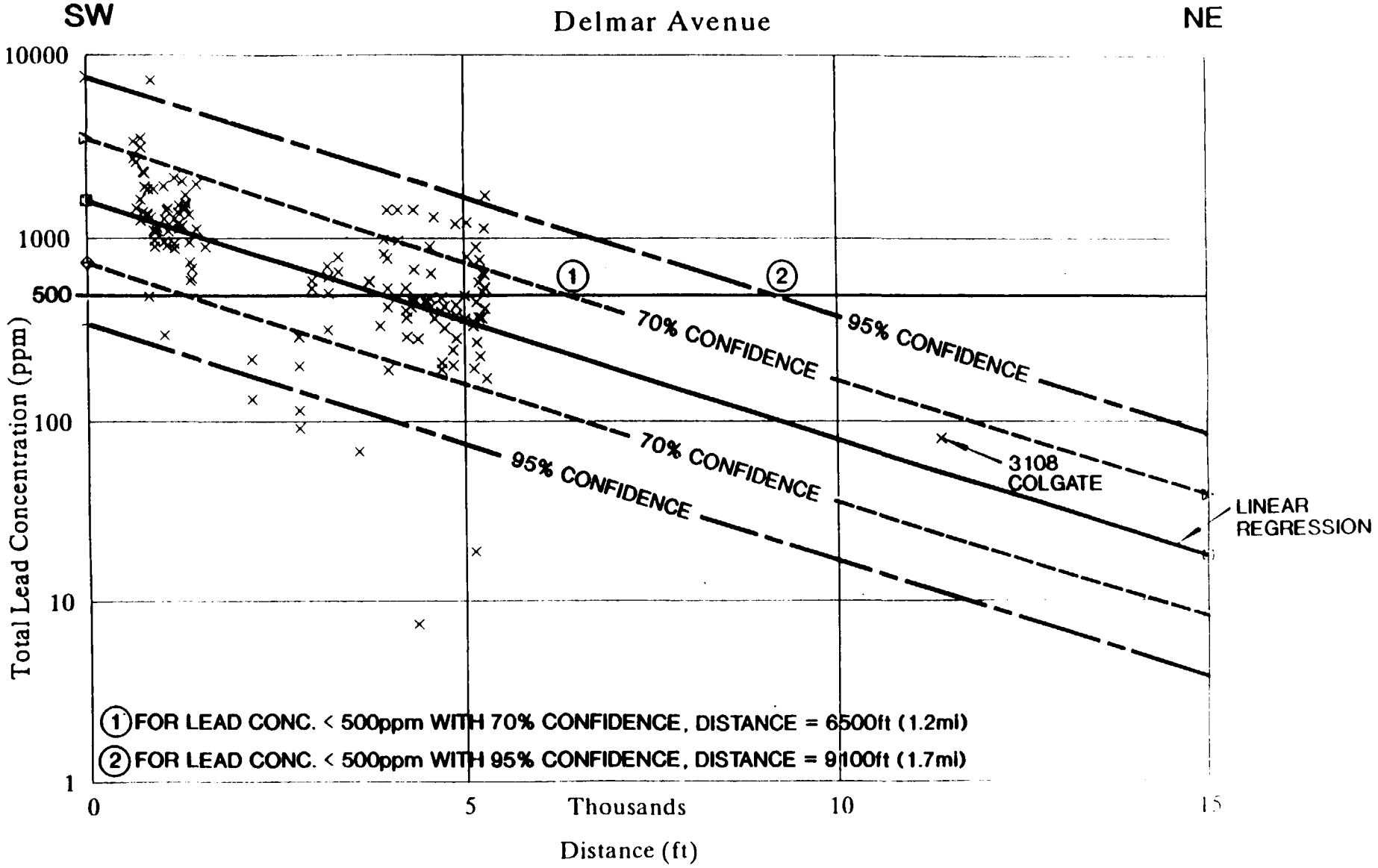

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Figure 2

Soil Lead Level vs. Distance From Smelter

Edison Avenue

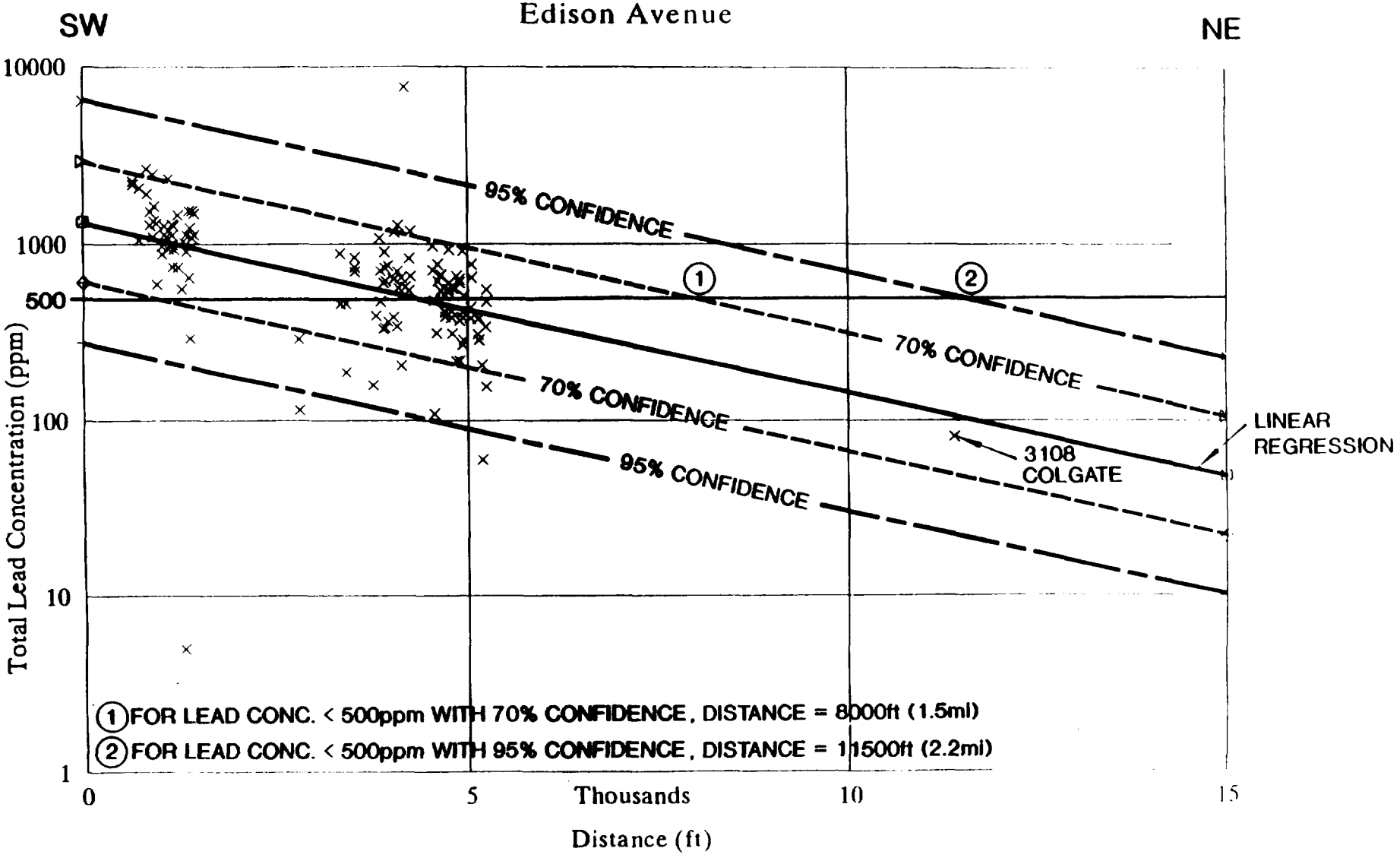

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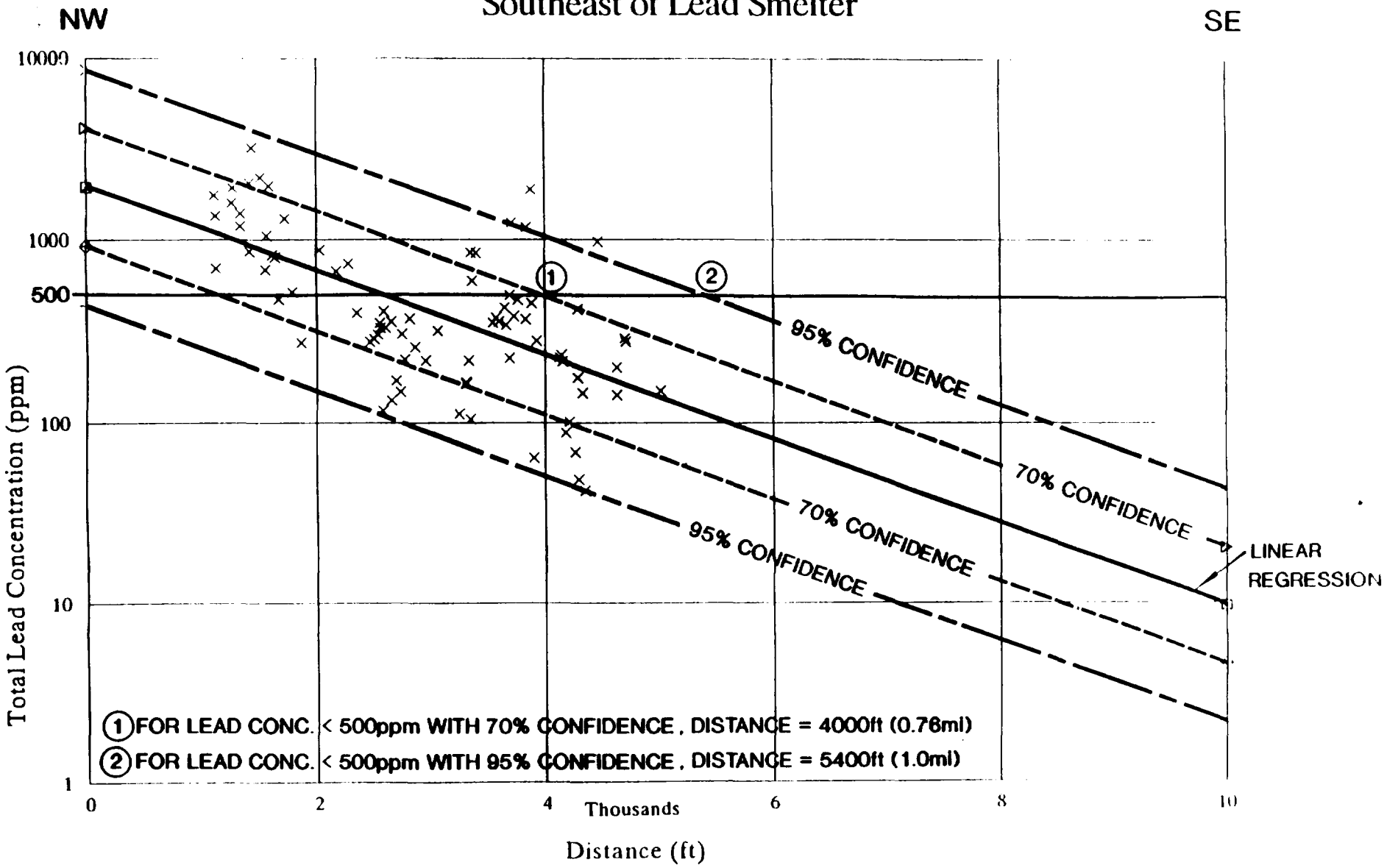
Figure 3
Soil Lead Level vs. Distance From Smelter
Southeast of Lead Smelter



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Date: 12/22/92

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FIGURE 5

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